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The potato grower has much with which to contend. Unlike many other crops the potato can be grown almost anywhere in the United States. The result is that when other crops fail to return a profit, potatoes are very often planted as a substitute. This was particularly true in 1932 and present indications are that it will happen again this year. This, of course, leads to overproduction and low prices for all. As a consequence the occasional grower makes no profit and, in those sections where a specialty has been made of potatoes, the growers suffer serious losses. It must be recognized also that the potato industry has been injured by advertising campaigns in which it has been suggested that other foods be substituted for the potato. To date only a few spasmodic efforts have been made to off-set this propaganda.

These and other factors, coupled with the general economic situation, makes the plight of the potato grower a desperate one. What is to be done about it? Shall we look to the government for relief, or attempt to better our condition through our own efforts. A reduction in taxes together with a readjustment of the mortgage situation will unquestionably afford relief. Government aid, properly applied will help. As potato growers, however, we must in the final analysis do everything we can to improve our own situation if we are to continue the production of the crop.

All indications point to low prices again this year. Low prices can be met only by low production costs. These, in turn, can result only from the adoption of efficient methods. The grower who produces a good quality crop at the lowest possible price is best able to meet present conditions. How can the grower acquaint himself with the new developments in the potato industry? We hope to enable him to do this through the pages of the AMERICAN POTATO JOURNAL. Articles on all phases of the potato industry, by the foremost authorities on their subject, will appear from month to month. The progressive potato grower is certain to find much of value in the JOURNAL.

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CONCENTRATED FERTILIZERS FOR POTATOES ON THREE IMPORTANT SOIL TYPES¹

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INTRODUCTION

Concentrated fertilizers were practically unknown to many fertilizer users 10 years ago. As a matter of fact, their usage did not become marked until within comparatively recent years. During the past few years, as the result of experimental trials and practical experience with concentrated fertilizers, ranging from 40 to 60, and more, units of plant food to the ton, potato growers have come to appreciate their advantages in effecting certain economies in freight, storage, hauling, and general convenience. The chief concern of the grower naturally has been—Will these concentrated fertilizers produce as many bushels of salable potatoes to the acre as the ordinary-strength fertilizers, when equivalent amounts of plant food are used?

It is believed that the answer to this inquiry will be influenced largely by soil type, seasonal conditions, kind of salts used in making up the fertilizer formula, degree of purity of such salts, and what method of fertilizer placement is followed.

REFERENCE TO PREVIOUS REPORTS

A report³ on concentrated fertilizer work in 5 states over a period of 4 years was presented at the 15th Annual Meeting of the Potato Association and later published in the Proceedings. Three points stressed then are equally important now. They were as follows: (1) Concentrated fertilizers should possess a proper physical condition to insure satisfactory drilling with the potato growers' fertilizer distributing machine. The development of suitable machines for distributing concentrated fertilizers is highly desirable. This part of the general problem relating to the use of concentrated fertilizers will have to be given serious consideration; (2) Concentrated fertilizers must be so applied that direct contact with the seed-piece is avoided. This is particularly important on light, sandy soils; (3) While savings in freight and other

¹ In cooperation with the Maine and Pennsylvania Agricultural Experiment Stations and the Virginia Truck Experiment Station.

² Division of Soil Fertility Investigations.

³ Brown, B. E., Concentrated Fertilizers for Potatoes. Proceedings Potato Association of America, 15th Annual Meeting, 1928.

items are important nevertheless they must be weighed against the behavior of the concentrated fertilizers toward the crop itself with respect to germination, growth, and final yield.

In reference to the foregoing it may be stated that laboratory and field work have been very helpful in the practical solution of some of these problems. First of all, satisfactory mechanical condition of concentrated fertilizer mixtures has been effected. Of equal importance has been the improvement in fertilizer distributing machines whereby uniform application of the fertilizer, properly placed in reference to the seed-piece, is more certain. These improvements have done much to insure uniform germination and stand so that potato yields obtained with concentrated fertilizers have, in the last few years, compared favorably with the performance of ordinary-strength fertilizers. During the period following the presentation of the results at the 15th Annual Meeting considerable activity has ensued in connection with concentrated fertilizer problems and a number of papers have been published by different workers interested in the subject.

The Bureau of Chemistry and Soils, through the Division of Soil Fertility, in cooperation with a number of the State Experiment Stations, has been studying the effect of these high-powered fertilizer mixtures on a number of important soil types with different crops. Many problems are being considered in the cooperative work, including the influence of uncommon elements when added to concentrated fertilizers, method of placement of such fertilizers, and related matters of interest.

The present paper is a brief report covering field comparisons of ordinary-, double-, and treble-strength fertilizer mixtures containing in most cases 20, 40, and 60 units of plant food to the ton. Results obtained in Maine, on Caribou loam; in Pennsylvania, on Berks shale loam; and in Virginia, on Norfolk sandy loam, are presented.

OUTLINE OF EXPERIMENTAL WORK⁴

The field experiments were conducted in cooperation with the Maine and Pennsylvania Agricultural Experiment Stations and the Virginia Truck Experiment Station, on the farms of commercial potato growers, who looked after all cultural details, such as cultivating, spraying, etc. Experimental details in each section were supervised by a representative of the Bureau of Chemistry and Soils and the Station concerned in the cooperation. All comparisons were made in a practical way so as to have the work coincide with the growers' regular farming practice. Large plots were planted and when available the fertilizer distributing machine found on the farm was used to apply the different fertilizer mixtures.

⁴ The writer wishes to acknowledge the helpful assistance of V. C. Beverly, A. L. Hacker and W. O. Strong, County Agents, respectively, in Aroostook County, Me., Lehigh County, Pa., and Accomac County, Va., in the field studies.

The objects of the comparative studies were:

First, to determine whether the three types of fertilizers, after having been mixed for several months and exposed to average storage conditions found on farms would possess a satisfactory mechanical condition for drilling uniformly at planting time.

Second, to determine whether the fertilizer distributing machines found on the farms would drill the three plant food mixtures uniformly and at the desired acre rate of application.

Third, to determine the comparative effectiveness of the single-, double-, and treble-strength fertilizer mixtures on the growth and yield of potatoes on prominent soil types.

The three plant food concentrations employed in the practical field study were formulated as follows: The ordinary-strength mixture contained the usual run of ordinary fertilizer materials, including sodium nitrate, ammonium sulphate, dried blood, superphosphate, and muriate of potash.

The double-strength mixture differed from this in that Ammo-phos A was substituted for superphosphate and the ammonium sulphate reduced by the amount of ammonia furnished by the Ammo-phos. The other nitrogen carriers on account of the ammonia supplied in the Ammo-phos were reduced proportionately.

The treble-strength mixture also carried Ammo-phos as a source of phosphoric acid. The potash was derived from potassium nitrate. A portion of the nitrogen was derived from urea, chiefly because it was found necessary to eliminate all other organic nitrogen from the treble-strength mixture in order to obtain the desired concentration. As a rule the same quantity of urea was added to the single- and double-strength mixtures.

MECHANICAL CONDITION OF MIXTURES AT PLANTING TIME

All of the mixtures after having stood for several months possessed good drillable qualities at time of planting so that no difficulty was experienced in applying them uniformly and at the proper rate. There were one or two cases of soft lumping which were taken care of by the stirrers in the fertilizer hopper before delivery to the tubes. There were also cases of too free delivery of the treble-strength mixture which necessitated careful calibration of the fertilizer distributor.

In order to obtain proper settings of the fertilizer distributing device on the potato planter it was necessary to have the different fertilizers weighed out for each row. By making an approximate setting and noting whether the fertilizer ran out before reaching the end of the row or whether some was left it was feasible to get an adjustment accurate to well within the limit of error involved in such work. After establishing the setting for a fertilizer mixture it was all applied before setting the planter for another mixture.

In Maine, different makes of potato planters were encountered, all of them applying fertilizer on each side, making a split application.

In Pennsylvania, the fertilizer was applied by hand, owing to the fact that the cooperators usually broadcasted and harrowed in his fertilizer.

In Virginia, the fertilizer mixtures were applied with a three row distributor, the rows first being furrowed out.

PERFORMANCE OF POTATO DISTRIBUTING MACHINES FOUND ON FARMS

In every case, but one, no difficulty was experienced in setting the machines for the double- and treble-strength mixtures or in applying the mixtures uniformly. The exception noted was in Aroostook County where trouble was experienced one year in applying treble-strength goods. This was attributable to an old style planter with a fertilizer adjustment planned to distribute heavy rates. In attempting to regulate the machine for an application of one-third ton to the acre it was found this could not be done satisfactorily with the result that the fertilizer went on 11 rows instead of 18.

RESULTS OBTAINED ON DIFFERENT SOIL TYPES

On Caribou Loam, in Aroostook County, Me.

The results obtained on Caribou loam in Aroostook County are given in Table 1.

It will be noted that while yield variations occurred from year to year and from farm to farm the general average shows very little difference of significance among the three mixtures; the greatest average difference of 9 bushels for the entire experiment having been between the ordinary- and treble-strength, with the double-strength yield just between these.

It should be borne in mind that these tests covering 3 to 4 years were not confined to the same land but were moved in accordance with the rotation. It will be essential perhaps to establish tests of this nature for a number of years on the same land to determine the cumulative effect of the concentrated fertilizers in comparison with the ordinary fertilizer mixtures. One of the main problems connected with the use of concentrated fertilizers is whether their continued use will tend to make for certain soil deficiencies, such as available calcium or magnesium, on account of the relatively greater purity of the materials used in their manufacture.

Results Obtained in Pennsylvania⁵

The same general plan of experimental procedure was followed in Pennsylvania as in Maine with the exception that the three mixtures

⁵ G. V. C. Houghland, of the Bureau of Chemistry and Soils, was associated with the work during the period presented.

TABLE 1.—Yield results obtained in concentrated fertilizer experiments with potatoes in Maine—1930–1932
Comparisons of 5-8-7, 10-16-14, and 15-24-21
Soil Type—Caribou loam

Fertilizer Applied	Rate of Application per Acre	Higgins Farm (Irish Cobbles)		Emery Farm (Green Mountains)		Fletcher Farm (Green Mountains)		Sutter Farm (Green Mountains)		Average all Locations ^a
		1930	1931 1932	1930 1931 1932	1930 1931 1932	1930 1931 1932	1930 1931 1932	1930 1931 1932	1930 1931 1932	
	Pounds	Bus.	Bus.	Bus.	Bus.	Bus.	Bus.	Bus.	Bus.	Busels
5-8-7	2,000	334	389 334	240 406 360	392 344 415	453 374 408	374			
10-16-14	1,000	330	400 328	238 364 361	410 345 391	442 390 376	368			
15-24-21	667	b	388 331	232 344 332	405 364 425	429 388 381	365			
No fertilizer .....	.....	161	302 221	155 199 182	306 215 271	274 254 304	241			

^a Yields obtained on Higgins farm in 1930 not included.

^b Yield record not taken owing to very uneven distribution of fertilizer.

were applied by hand. In this particular potato growing section one of the customary methods is to broadcast the fertilizer with the fertilizer attachment of the grain drill. In the present work, however, arrangements were made to have the rows marked off and the fertilizer applied in the row by hand. To do this the amount of fertilizer required for each row was weighed out to insure the right rate per acre. The yields for 4 years, 1929 to 1932, are given in Table 2.

TABLE 2.—Yield results obtained in concentrated fertilizer experiments with potatoes in Pennsylvania, 1929-1932

Comparison of 5-8-7, 10-16-14 and 15-24-21
Soil Type—Berks shale loam. Variety, Rural Russet

Fertilizer Application ^b	Rate of Application per Acre	Acre Yields (Total) Obtained on Leiby Farm (Lehigh County, Pa.)				Average Yields
		1929 ^a	1930 ^a	1931	1932	
	<i>Pounds</i>	<i>Bus.</i>	<i>Bus.</i>	<i>Bus.</i>	<i>Bus.</i>	
5-8-7	1,200	218	134	406	270	257
10-16-14	600	217	118	407	268	252
15-24-21	400	239	132	404	260	259
Unfertilized .....	.....	235	135	289	252	228

^a Very dry weather prevailed during the growing season, especially so in 1930.

^b All plots were in clover sod to which manure was applied before plowing.

It will be noted that in three out of four years the response to fertilizer was not significant. Only in 1931 was there a real response. Climatic conditions prevailing the other seasons, particularly 1930, were much less favorable to high yields than in 1931. Probably another reason why the yields of the unfertilized plots compared favorably with the fertilized plots was due to the fact that in the dry seasons, when lack of rainfall was the chief factor contributing to low yields, the accumulation of fertilizer salts in the surface soil may have resulted unfavorably.

The main comparison furnished by the Pennsylvania results centers on the averages for the entire period given in the last column of Table 2, which discloses that the ordinary-, double-, and treble-strength mixtures gave practically similar yields.

Results Obtained in Virginia

The results of the experimental work in Virginia, covering a period of 3 years, 1929 to 1931, are given in Table 3. On the basis of average results for the entire period it will be noted that the double- and

treble-strength mixtures did slightly better than the ordinary-strength. There was also marked response from the applied fertilizers.

TABLE 3.—Yields obtained in concentrated fertilizer experiment with potatoes in Virginia, 1929-1931

Comparison of 7-7-4, 14-14-8 and 21-21-12

Soil Type—Norfolk sandy loam. Variety Grown—Irish Cobbler

Fertilizer Application	Rate of Application per Acre	Yields (Total) Obtained on Griffin Farm				Average
		1929	1930 ^a		1931	
			Early	Late		
	<i>Pounds</i>	<i>Bus.</i>	<i>Bus.</i>	<i>Bus.</i>	<i>Bus.</i>	
7-7-4	2,000	218	149	108	177	163
14-14-8	1,000	217	166	126	170	170
21-21-12	667	225	141	119	179	166
Unfertilized .....	.....	118	110	81	78	97

^a One experiment was planted early, several weeks before the late planting. Harvested several weeks apart.

In 1930 two experiments were conducted. One represented early planting, the other late planting. In other respects the experiments were identical. The early planting gave better results as is generally the case. It was thought that the two dates of planting might furnish some idea as to the influence of weather conditions, chiefly rainfall, on the comparative effectiveness of the different mixtures. In the case of the treble-strength, for example, made up entirely of soluble salts, it would be well to know whether heavy rainfall following early planting would tend to leach the available elements out of reach of the young plants and thus tend to reduce the yields below that obtained with the less concentrated fertilizer mixtures.

SUMMARY

Cooperative field studies to determine the comparative effectiveness of ordinary-, double-, and treble-strength fertilizer mixtures for potatoes were conducted in Maine, on Caribou loam; in Pennsylvania, on Berks shale loam, and in Virginia on Norfolk sandy loam. These are widely separated sections and afford a marked diversity of soil types and climatic conditions.

The general trend of the results shows very little difference in the matter of yields no matter whether ordinary-, double-, or treble-strength fertilizer was applied.

It was found that the three fertilizer concentrations possessed a satisfactory mechanical condition after having stood for several

months. It is recognized that in the present work the fertilizer batches were small and it by no means follows that a similar result would attend large-scale factory operations where large piles of fertilizer are involved. The results of investigational work and factory research during recent years have done a great deal to surmount the difficulties resulting from poor mechanical condition, so that it is now practicable to use concentrated fertilizers to better advantage than ever before.

One phase of the field work in Maine and Virginia involved the use of fertilizer distributors as found on the different farms. In all cases, but one, no difficulty was experienced in getting the machines properly set to apply the different rates of application in an even fashion. The exception was one of the older types of potato planters without sufficiently refined adjustments. A later type of the same make has been used with entire satisfaction, indicating that it is feasible to so modify potato fertilizer distributing machinery that even concentrated fertilizer may be applied uniformly and at the desired rates of application.

A COMPARISON OF THE TUBER-UNIT AND THE TUBER-INDEX METHODS OF POTATO IMPROVEMENT

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The tuber-unit method of potato improvement has been part of seed potato certification régime, in Kentucky, ever since this work was begun. In fact, the Fayette County Certified Seed Potato Growers' Association has made the growing of a "tuber-unit plot" obligatory for its members.

As it must be used in Kentucky, the tuber-unit method has its drawbacks. The units must be planted by hand, in as much as the extent of the plantings does not warrant the use of a special unit-planter. The planting is done in late July, when the "second crop" of Cobblers is planted. At that time the weather is often extremely hot, and the soil dry. Under such conditions, even though the furrows are laid off immediately before the planting, stands are frequently spotted, and because of damage to the seed pieces the plants that do come up, are often weak.

Just what to do about plants that are weak is a problem since there are other causes for weakness besides damaged seed pieces. The longer such units are left to get over "weakness" the more opportunity there is for spread of disease, if disease is really the cause, as it sometimes is. The difficulty is increased in that by the time a weak unit has apparently recovered from an unfriendly start, temperatures may have gotten so high as to mask all but the most severe types of mosaic. Such plants are obviously disseminating agencies for mild mosaic, at least. Leafroll is another of the diseases difficult to eradicate through

ordinary systems of roguing, because, although a practiced grower can identify this disease when the plants first come up, through the shape of the leaves and through the green-yellow color of the foliage, many growers wait until the "rolling" actually takes place. This happens late in the season, the affected plants having been adjudged innocent up to this time, which of course they are not.

In 1928, Kentucky's killing frost came in September, before any but the most severe cases of leafroll became evident, and, as was expected, many potato plantings entered for certification, in 1929, were rejected because of leafroll.

The possibilities of the tuber-index method of potato improvement had long intrigued the writer, in as much as in this state no greenhouse would be needed, but the index plantings could be made as part of the spring crop. Soil and weather conditions in the spring are likewise more favorable to hand planting than in July.

The method is somewhat complicated and even good growers evinced little enthusiasm when they were asked to try it. Accordingly, the writer began, in 1930, to work out a technic simple enough to increase its appeal even to the more average growers, and in that year 200 tubers were indexed and recorded. In 1931, the work was repeated, building on the experience of the previous year, and the following procedure was evolved.

EQUIPMENT REQUIRED

(1) Several sheets of heavy writing paper, ruled to make squares of about an inch. In these squares, numbers, beginning with 1 are written, in pairs, with a soft lead pencil.

(2) A number of 4-lb. paper sacks, these plainly numbered "1-10," "11-20," "21-30," and so on.

(3) A barrel in suitable condition to be put into cold storage, and a number of sacks, or a quantity of newspaper.

(4) Shears, a quantity of 6-penny nails or 1-inch brads, but not tacks.

(5) The tubers to be indexed; the larger, the better.

PROCEDURE

(a) Some time in January, cut a standard seed piece from the stem end of each tuber to be indexed. Using a 6-penny nail, affix to the seed piece one of the numbered squares of paper described in (1) and put it into the corresponding paper sack. For example, the number of the first index piece cut would be 1, and it should go into the sack marked "1-10." To the remnant of this tuber, affix the other number 1, and put it into the barrel. When the first sack contains 10 pieces, begin on the next ("11-20"), and so on. When 20 remnants have been put into the barrel, a piece of sacking or several

newspapers should be spread to separate them from the next layer of 20 remnants, and so on until the barrel is filled. The paper sacks of index pieces should be kept with the rest of the seed to be planted in the spring, and the barrel of remnants put into cold storage with the seed that is to be planted for the "second" crop, in late July.

(b) In March, planting time for the spring crop, the rows where the indexed seed pieces are to be put should be laid off and planted in the customary manner, except that the pieces should be dropped no closer than 15 inches, so that each plant may be studied individually. The pieces should be dropped in numerical order, and after each sackful a stake should be set, to prevent "losing count" when observations are being made.

(c) Get a note-book, ruled preferably 20 lines per page, and number the lines in numerical order representing the total number of tubers to be indexed.

(d) When the potatoes commence coming up, observations should begin and they should be repeated once weekly, for at least 6 weeks. Key letters may be used to designate earliness in coming up, earliness in blooming, or any other outstanding characteristic of the plants that are to be retained; the undesirable plants may be marked out forthwith, as soon as there is evidence. Pulling out plants is not necessary, in as much as spread of disease need not be feared.

(e) As an additional refinement, the especially desirable index hills may be dug by hand, and further classification made. (In Kentucky, the "first" crop matures several weeks before the "second" crop is planted.)

(f) In July, when the seed for the "second" crop is taken from cold storage, the barrels of remnants should be opened carefully, and with the note-book opened to correspond with the layer of remnants, the undesirable potatoes are sorted out, the others are cut and planted all together, or in selected lots, using a planter.

CONCLUSIONS

Following this method of procedure, 4 Kentucky growers indexed 1,000 tubers each in 1932. Although it is too early to say that "indexing" will supersede "tuber-uniting," yet several things stand out.

1. The cutting and indexing of the tubers is done at a time when there is little other work that may be done.

2. The stand in the rows of indexes was full and even this spring because of the good conditions for hand planting.

3. "Roguing" of undesirable index hills is not laborious, done with a pencil, and it is complete.

4. Selection can be better made in the spring, for characteristics that determine seedstocks desirable to use for the spring crop, the main crop of Kentucky growers.

5. Because the remnants may be planted with a planter, even covering and minimum loss of soil moisture are assured, and better stands and better yields result.

6. The labor involved in indexing is less than when the tuber-unit method is used, more than offsetting the apparent complications the index method entails. The men who have used the index method feel, as does the writer, that it enables the grower more rapidly to improve his seedstocks, with respect to the running-out diseases. This remains to be proved until seed grown by both methods in 1932 are planted side by side in 1933.

POTATO TRENDS

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In the present period of below-cost-of-production prices for most agricultural products it is well to consider seriously every practical method of reducing the unit cost of producing and marketing any given farm commodity. To this end a survey of the trends in potato production may be of interest to both the grower and handler of this crop.

It is obvious to all that one of the most certain methods of reducing the unit cost of production is to increase the acre yield through up-to-date cultural practices. By this we do not mean an extravagant use of commercial fertilizers or unnecessary cultivations or sprayings, but rather the adoption of methods that have given best results. The trends in this direction, in so far as they have come under our observation, are greater discrimination in the selection of soils best suited to potato production, a more general use of cover crops to increase the organic content of the soil and thereby impart to it a greater moisture holding capacity. Deeper plowing and more thorough preparation of the seedbed is now receiving greater consideration by progressive potato growers. Commercial fertilizer constituents and ratio of each most suitable to the requirements of different types of soil, together with their most economical use are phases of potato nutrition that are now uppermost in the minds of the producer. Along with the above trends must be included that of the use of high-grade seed. The gradual improvement in the quality of certified seed potatoes through the adoption and enforcement of more rigid requirements for certification is leading to a more universal use of such seed. Furthermore, through the results of competition for membership in 300, 400 or 600 bushel potato growers' clubs abundant evidence has been adduced to clearly indicate the necessity of planting a liberal quantity of seed per acre. These are the outstanding preliminary factors or trends involved in

greater yields per acre. When these are supplemented with intelligent cultivation and thorough spraying of the plants with suitable fungicides and insecticides the grower has complied with all the cultural requirements necessary to the production of a maximum crop.

While the above practices are fundamental to large yields there are other factors entering into the problem of lowered cost per unit. One of the most important is that of the development of potato implements of greater capacity and efficiency. For example, compare the horse-drawn single-row automatic planter with a capacity of 4 to 6 acres per day, depending of course on the length of the day, with the recently developed Iron Age tractor-drawn 4-row automatic planter with a capacity of 25 to 30 acres per day. In a similar manner compare the single-row one-horse cultivator with the tractor-drawn battery of four 2-row cultivators. The manufacturers of spray outfits have shown an equally progressive attitude toward increased capacity and efficiency and we now have motorized spray machines capable of maintaining high pressures and of covering 12 or more rows. Under convenient conditions, a 10-row motorized sprayer is capable of spraying 100 acres per day.

Thus far we have dealt with the problem of increasing yields and reducing production costs. Our next consideration is that of conserving the crop produced by reducing the percentage of mechanical injuries involved in the harvesting and handling of the crop.

Harvesting the Crop.—The greatest progress that has been made in harvesting the crop is not so much in the use of 2- and 3-row diggers as in the efforts being made to lessen mechanical injury of the tubers in harvesting operations. This is being accomplished by the use of a continuous elevator apron, reduction in angle of elevation of the apron, lowering the apron at the rear to lessen the drop, covering the apron rods with rubber tubing and padding such portions of the frame of the carrier as are likely to cause injury. Further reduction in mechanical injury may be noted in a more general padding of wire and splint baskets used in gathering the potatoes, greater care in their transfer to sacks or barrels and in their handling from the field to the storage house. The folly of taking every precaution to produce a large yield, and then by careless handling to render a large portion of it unfit for U. S. No. 1 grade, is being more fully recognized now than ever before.

Stabilization of Production.—On account of the extremely wide variation in acre yields that may occur as a result of unfavorable climatic conditions, it is extremely difficult to determine the proper acreage necessary to supply the normal market outlets of any given area. Notwithstanding this obvious difficulty some progress is being made toward the stabilization of potato production in at least two regions. It is rather interesting to note that one is in the northwestern and the other in the southeastern portion of the United States. These regional

divisions emanated from the National Potato Institute which was organized in the spring of 1929 largely in response of an urgent need to consider ways and means for the disposal of the excessively large crop of 1928, and of formulating some operative plan for preventing a recurrence of the marketing conditions prevailing at that time, by endeavoring to so curtail acreage as to prevent its repetition.

The National Potato Institute through a special committee evolved the plan of dividing the country into regional districts in charge of a competent committee, with a salaried secretary. It is the latter's duty to confer with growers, bankers, fertilizer companies and other credit organizations, with a view to the voluntary restriction of acreage by the growers when deemed necessary, and withholding or according the grower credit as in the judgment of the Interstate Committee seemed desirable or advisable.

The two regions referred to embrace in the one case Maryland, Virginia, North and South Carolina, and Florida; in the other Idaho, Washington, Oregon, California, Montana, and Nevada. The former is known as the Interstate Early Potato Committee and the latter as the Pacific Northwest Potato Committee. The secretaries of these committees are A. E. Mercker and H. E. Drobish, both of whom are Agents of the United States Department of Agriculture, Bureau of Agricultural Economics Extension Service.

These two regional organizations, in addition to attempting to regulate production, are also active in their efforts to so restrict the flow of potatoes to marketing centers as to avoid an over or under supplied market.

A further function of these two committees is that of insisting on maintaining the standards of U. S. grades and in seasons of over-production to the limiting of shipments solely to grade No. 1 stock. In other words, every effort is being made to persuade the grower to keep his grade No. 2 stock at home. A good example of the folly of attempting to dispose of grade No. 2 stock in an over-supplied market occurred in Chicago in the early part of last September when grade No. 2 Idaho-grown potatoes sold at \$1.00 per hundredweight. Deducting an 80-cent freight rate and a 4-cent destination brokerage left the grower 16 cents net to cover sacks, shrinkage, grading, loading, etc. But this is not the whole story as the presence of this stock on the market was claimed to have been responsible for a decline in the price of grade No. 1 stock of approximately 25 cents per hundredweight.

The failure of all other regional districts to maintain a working committee, and the comparative inactivity of the National Potato Institute to function effectively as a whole, reflects the seemingly insurmountable difficulty of successfully organizing any agricultural industry, and particularly that of the potato.

Consumer Packages.—A rather recent development in the mar-

keting of potatoes is that of putting them up in small packages suitable for the consumer's needs. The package in most favor at the present time is the 15-pound sack. Only strictly first-class tubers are packaged in this manner. Furthermore, there is an increasing tendency on the part of commission firms or organizations marketing potatoes in this manner to thoroughly wash or brush the tubers before packaging them. Machines for both washing and brushing are now available for these purposes. Our preference is for the brush machine which removes the soil and polishes the skin of the potato in one operation. When potatoes are so cleaned it is much easier to detect and remove all defective tubers, thus ensuring a better grade. Machines are now available that will brush and polish 1,000 bushels of potatoes per day. It is conceivable that machines of greater capacity will be developed if the need for them arises.

While much more evidence might be presented it is apparent from what has been discussed that the potato growers and marketing agencies are alive to the possibilities for cost reduction per unit and better methods of handling and distributing the crop.

CROP AND MARKET NEWS

(Contribution from the Bureau of Agricultural Economics)

UTILIZATION OF THE 1932 POTATO CROP

Of the estimated total crop of 326,599,000 bushels in the 37 late and intermediate States in 1932, reports to the U. S. Department of Agriculture indicate that a total of 123,000,000 bushels were left in the field, lost, wasted or fed to live stock by January 1 and saved for food and seed. This leaves a balance of nearly 203,600,000 bushels, representing potatoes sold by January 1 or then on hand and available for sale. Of this available stock, the growers' reports indicated that about 49 per cent, or 99,600,000 bushels, had already been marketed by January 1, 103,950,000 bushels were still on hand, on farms or in the locality where grown, and available for sale after January 1. A year ago, out of a crop of 335,000,000 bushels in the same 37 States, the quantity sold to January 1 or then available for sale is estimated to have been 220,600,000 bushels, of which slightly more than one-half, or 110,700,000 bushels, had been disposed of, and the remaining 109,900,000 bushels were still available for sale, as of January 1.

MOTOR-TRUCK MOVEMENT IMPORTANT

Of the 99,600,000 bushels of 1932 crop potatoes indicated as having been marketed to January 1, 1933, the amount moved by rail or boat appears to have accounted for only 47,500,000 bushels. This is less than 48 per cent of the total marketings to January 1, compared with about 58 per cent of the total for the corresponding period a year

ago and between 67 per cent and 70 per cent for the previous two seasons.

The approximate quantity of potatoes sold to January 1 but not accounted for in rail or boat shipments amounts to 52,100,000 bushels of the 1932 crop in the late and intermediate States, compared with 47,000,000 bushels of the 1931 crop, 33,800,000 bushels of the 1930 crop, and 38,100,000 bushels of the 1929 crop. A large part of the increase in these quantities in recent years is explained by the greater use of motor trucks in marketing the crop. The exact proportion represented by motor-truck movement is difficult to determine, but growers furnished some basis for rough approximations in their January reports. These reports indicated that, of the total of 99,600,000 bushels marketed up to January 1, auto-truck movement represented about 40 per cent.

Information for the various groups of States indicates the following percentages of the marketings to January 1 moving to market by auto truck:

	% by truck		% by truck		% by truck
3 Eastern surplus	51	5 New England	79	30 Late states	43
5 Central surplus	36	5 Central	72	7 Intermediate	34
10 Western surplus	19	2 Southwestern	73	—	—
—	—	—	—	37 States	41
18 Surplus late	37	12 Other late	74		

There are no data of this character available on truck movement in previous seasons, nor can the indications be directly applied to the marketing after January 1. However, they do provide a fairly useful measure of the part the auto truck is taking in marketing the late and intermediate potato crop.

SECTIONAL NOTES

SOUTHERN STATES

Alabama is reported as intending to plant 8,000 acres this year, which is a 20 per cent reduction from the 10,000 planted last year, when 1,873 cars were shipped. Due to the excessively cold, wet weather, planting has been greatly delayed. In 1932, 60 per cent of the crop had been planted prior to February 5, and the remainder of the crop was planted between February 6 and February 15. This year only 15 to 20 per cent of the acreage intended for planting had been planted up to February 18. The potatoes planted before the freeze in most instances were not damaged to any extent by the cold weather, although the continuing rains following the cold weather may do some damage to the seed pieces already planted.

The acreage intended for planting in Georgia this year is 600 acres. In Oklahoma the intended acreage is estimated at 6,700 and it is estimated that 4,600 acres will be planted in Arkansas, a reduction of 10 per cent.

In South Carolina, 7,600 acres are intended for planting, which is a 16 per cent decrease from the 9,000 planted in 1932, when 1,666 cars were shipped. Shippers and growers in that territory have, however, advised us that the crop in South Carolina may not exceed 5,000 acres. Very little acreage had been planted in South Carolina and Georgia prior to February 13 because of wet weather.

North Carolina is planning an increase of approximately 1,500 acres above the 23,500 acres planted in 1932. About half of the crop was planted the last week of February and the remainder the first week of March. In 1932, nearly 85 per cent of the State's crop had been planted by February 20.

The Norfolk section of Virginia is intending to plant about 7,900 acres this year, which is about the same as that planted last year and is 29 per cent less than the 11,200 acres planted in 1931. In 1932, 2,678 carloads were shipped, which was 18 per cent less than the quantity shipped in 1931. Planting has been delayed because of the wet, cold weather. In 1932, 60 per cent of the crop was planted between March 14 and March 26, and the remainder of the crop was planted before March 5.

The growers on the Eastern Shore of Virginia intend to plant about 36,200 acres to Irish potatoes this season, which is 23 per cent less than the 47,000 acres planted last year, when 9,692 carloads were shipped. In 1932, about one-half of the acreage in Northampton County had been planted by March 5, the remainder being planted between March 14 and 26. In Accomac County about 35 per cent of the acreage had been planted by March 5, the remainder being planted between March 14 and April 1.

Only a 7 per cent decrease in acreage is being intended on the Eastern Shore of Maryland, which shipped 1,600 carloads of Irish potatoes in 1932, compared with 1,752 shipped in 1931. Yields per acre on the Eastern Shore of Virginia and Maryland were exceptionally light in 1932, due to the excessive drought.

The Early, Second Early, and Intermediate States intend to plant 244,400 acres to potatoes in 1933. This is a reduction of 12 per cent from the 276,500 planted last year, from which there were shipped 48,364 carloads, or 39 per cent less than the 79,841 cars shipped in 1931. Rainfall has been plentiful this season, whereas last season there was not enough.—A. E. MERCKER, U. S. D. A.

MARYLAND

Approximately 6,700 acres will be planted in Maryland this year if potato growers carry out their intentions, a reduction of seven per cent over 1932. Practically all of this reduction will be made on the early Cobbler crop on the Eastern Shore. Indications are that practically the same amount of fertilizer will be used in 1933 as was em-

ployed in 1932 but that greater care will be used to avoid placing the fertilizer where it comes in contact with the seed piece or sprouts. This precaution is being taken because of the uneven stands and stunted plants which resulted from careless fertilizer placement last year in many of the Maryland potato fields, especially in the early Cobbler crop on the Eastern Shore.

There will be an increase in the amount of home grown certified seed used by Maryland potato growers and a consequent decrease in the amount of northern grown seed.

On the Eastern Shore, indications are that approximately seventy-five per cent of the early crop will be planted from second crop home grown seed, much of which passed seed certification requirements.

On the Western Shore there will be a large increase in the use of Garrett County certified seed in the place of home grown uncertified and northern grown certified and uncertified seed. There will also be a considerable amount of second crop Eastern Shore certified Cobbler seed used on the Western Shore.—R. A. JEHLE, Agr. Exp. Sta.

MAINE

The Maine Potato Growers, Inc., was organized previous to the present shipping season by a group of the more progressive and interested producers in Aroostook County. For a period of two years, plans have been under way for the formation of such an organization. Much valuable assistance was rendered to those interested, by the Extension Service of the University of Maine, the county agents of Aroostook County, and the Federal Farm Board at Washington. Through this valuable assistance, the marketing organization was set up during the harvesting season of 1932. At the very outset, emphasis was placed upon making the organization a growers' cooperative and that has been in the minds of the leaders all through the development. While there are a number of members who buy considerable tonnage, their own production goes through the association and much of the purchased tonnage. Eighty of the better farmers signed up their production for the organization, which makes an approximate tonnage of twenty-five hundred cars. A large percentage of the tonnage consists of certified seed. It has been found that the membership controls approximately fifteen per cent of the certified seed in the county, which made it the largest single factor in the deal.

During the formation of the 1932-33 marketing program, Mr. J. B. White, of Boston, was secured as sales manager for the central organization. Mr. White has had much valuable experience in the handling of Maine potatoes and other agricultural products in a cooperative way.

The Maine Potato Growers, Inc., represents the union of five locals, one each being located at Caribou, Fort Fairfield, Presque Isle, Mont-

cello and Sherman Mills. Each local has a separate corporate set-up but it is served in the marketing program by the central organization. This plan was devised to permit local factors to adjust themselves in their own locality and thus eliminate some of the difficulties that the previous cooperative organization had encountered. It has permitted a great amount of local initiative which has resulted in spurring the more backward locals to increased activity.

The deal this season, as every potato man knows, has been an extremely difficult one but even with this handicap, the organization has made a very good showing. Membership is well satisfied and it is expected increased support will come on the basis of the present record. A large part of the success thus far has been due to the courage and optimism and morale of the members. The eyes of the potato trade have been focused upon the efforts of the organization and thus far they have found little basis for criticism. The members have been marketing their potatoes consistently through the season and in keeping with the general price trend and in that connection the co-operative has been of valuable assistance in inducing the grower members to market regularly rather than in a haphazard manner as is usually the case.

Careful observers also feel that the association has contributed a great deal to the stability and improvement of the seed potato price level, particularly as it affected Certified Irish Cobblers. They have been the only bright spot in the deal thus far this season and much of the strength has been due to the courage and persistence of the co-operative sales organization in their sales program.

It has been the purpose of the leaders to hold the membership for the initial year of operation to a small group, thereby eliminating many of the problems that come from a large scale operation with inexperience. With the constructive record that the organization thus far has achieved it looks forward to increased effort another year, endeavoring to maintain a sizeable operation that can be worked efficiently and for the best interests of the members and county. A brand has been adopted and policies looking toward improved grade standards and improved quality in all lines have been formulated.

The Certified Cobbler market has been showing much strength. The f. o. b. price February 25 was approximately \$1.75 sacked per barrel. The price on other certified varieties has not reacted in a correspondingly way but has held firmly to previous quotations. This, too, is a factor in making for stability in the price on table stock. There is every reason to believe that there will be a demand for what potatoes Maine has left, although, without doubt, the price level will not be sufficient to yield a return to the grower adequate to cover cost of production.

With prospects for another year as black as they are today, the

majority of Maine farmers are planning a considerable reduction in acreage. It is very probable that as a result of the "Outlook Meetings" held recently in Aroostook County, the growers will cut more than their "Intention to Plant" reports indicated. Conservative opinion in Maine holds to that idea. Even the advent of financial aid from the Reconstruction Finance Corporation will not change the picture materially for it is effectively encouraging considerable reduction.
—FRANK W. HUSSEY.

OHIO

The potato acreage in Ohio for 1932 was 117,000. Present intentions to plant indicate a 5 per cent increase in acreage for 1933. Much of this increase in planting intentions is due to the home production movement. The potato crop as grown in Ohio is a highly specialized one. When times were more prosperous and farm prices higher, there was a tendency for the general farmer to drop his small acreage because it was not profitable. Under present conditions, many farmers are again planting a few acres of potatoes, chiefly for home use. If conditions are favorable, they will have a few to sell; if unfavorable, they will not have enough for their own supply.

There are several muck areas in Ohio; the largest, 25,000 acres, is located in Hardin County. Most of the muck soils in Ohio have been used for vegetable crops, especially onions. Potatoes have been grown on these mucks but they were used for a crop to follow a sowing of onion seed that had blown out. These crops were not well grown and muck potatoes consequently had a reputation for poor quality. The last two years a few growers have planted Cobblers and given them proper care. These potatoes were brushed before being sent to the market. They made a good appearance, sold readily and were good quality. Muck plantings will be increased.

The chief varieties planted in Ohio are Cobblers for the early, and Russets for the late crop. Southern Ohio grows chiefly early, and northern Ohio late varieties. Naturally, there is no definite dividing line in the state. The last three years have been dry ones and the late crop in the southern part of the state has suffered from stem-end discoloration and misshapen tubers. These have been difficult to market. The Cobbler crop in the same section has suffered less from these troubles. The tendency is therefore to grow more Cobblers and less of the late potatoes, especially in the southern section.

Dry seasons the past few years have been responsible for some interest in irrigation. Some growers are planning to try the canvas hose system this coming year.—E. B. TUSSING, Agr. Exp. Sta.

LONG ISLAND

No one on Long Island, including the farmers, dealers, and bankers, looks forward with any assurance that the season of 1933 will be a

profitable one for the potato growers. Potato growing is our largest industry and our growers do not know what else to plant. Undoubtedly, there will be some shift to other crops in a small way, but no very large acreage. Our taxes are so high that it seems to prohibit the lying idle of good farm lands.

Those farmers who are able to finance themselves are reducing quite materially while many others will be unable to plant as large an acreage as in former years due to their financial situation. We have, however, a large number of farmers who have nothing more to lose, and if they can get money from some of the government agencies, they will gladly avail themselves of the opportunity. There seems to be a pretty general belief, by those in a position to judge, that this government relief will result in an increase in acreage and will not help the ones who get it. It certainly will very largely prevent those who are able to carry on from making any profit on their crop.

Our growers have been advised, by representatives of the United States Dept. of Agr. and our New York State men that there is need to grow the crop this season at as low a cost as possible. Among other things it has been suggested that the amount of fertilizer applied per acre may be reduced for one year without reducing the yield. It is true also that wages will be reduced.

An effort is to be made to see if it is possible to work out some form of cooperation with the New Jersey growers and dealers, with the hope that Maine and other New England states will join. At present no very definite plan has been devised. Every one connected with the potato industry, however, recognizes the necessity of some form of co-ordination of the marketing of our crop to prevent forcing down the market price.—H. R. TALMAGE.

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